

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

**ETM7146 - SWITCHING AND NETWORKING
TECHNIQUES AND SYSTEMS**

(All sections/Groups)

12 March 2016
2:30 P.M- 5:30 P.M.
(3 Hours)

INSTRUCTION TO STUDENT

1. This Question paper consists of 5 pages with 4 Questions only.
2. Attempt **All** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

Question 1

- (a) (i) Give an example each for circuit-switched and packet-switched networks respectively. [2 marks]
- (ii) Compare and contrast the inherent characteristics of circuit-switched and packet-switched networks [8 marks]
- (b) Suppose that you are a network engineer at a local service provider. In the network that you are handling, the network routers are subjected to stressful conditions that cause some of them to fail fairly often.
- (i) At a high level, what actions would need to be taken by the routers on such router failure? [1 mark]
- (i) Discuss whether the virtual circuit or datagram architecture is more suitable for this working environment. [6 marks]
- (c) In a remote learning classroom, video lectures are conducted over a packet switched network. You are asked to use a virtual circuit approach to setup this system. Explain your design (use diagram if necessary) and write a summary of your design choice. [8 marks]

Question 2

- (a) Consider the following conditions for a Transmission Control Protocol (TCP) connection:
- Initial value of `ssthresh`: 8
 - TCP buffer at the receiver is sufficiently large to accept any data transmitted by the sender
 - A timeout occurs when `cwnd` reaches 16. After that, three duplicate acknowledgements are received by the sender when `cwnd` reaches 8. The connection is ended when `cwnd` reaches 8 again.

Plot the evolution of `cwnd` against the round trip time between the TCP end-points based on the above conditions. Name and describe the working of different stages of TCP congestion control mechanisms involved. Give the values of `ssthresh` at each stage.

[10 marks]

Continued...

- (b) (i) Discuss the differences between Internet Protocol (IP) address and Medium Access Control (MAC) address in terms of portability. [3 marks]
- (ii) Consider two hosts, A and B, which are located within the same Local Area Network (LAN). Describe the working of the Address Resolution Protocol (ARP) that is used to obtain the IP to MAC address mapping when host A is sending a packet to host B. [5 marks]
- (c) Someone in your class suggests to modify TCP fast retransmit policy such that a fast retransmit is triggered after the first duplicate acknowledgement for a segment is received. State the original TCP fast retransmit policy. Then, discuss whether the above suggestion is appropriate for TCP. [7 marks]

Question 3

- (a) Figure Q2 shows the network configuration for a network segment in a university. Suppose that all computers use Fast Ethernet interfaces.

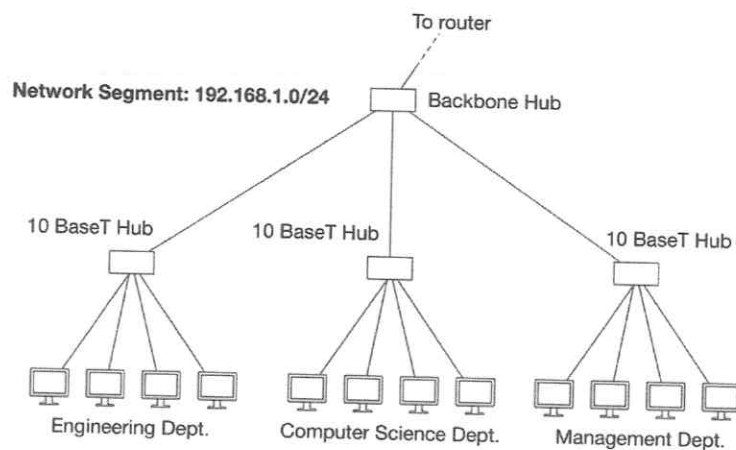


Figure Q2

- (i) Based on the network configuration in Figure Q2, discuss your observations on the throughput performance of the network segment. [4 marks]
- (ii) With the help of suitable diagram, discuss a strategy that can improve the throughput performance of the network segment. Discuss the characteristics of the resultant network. [5 marks]

Continued...

- (iii) Suppose that each department experiences a sudden increase in students intake such that each of them is required to support up to 200 computers. Discuss how would you redesign the network to satisfy the new requirements. Show the resultant network configuration.

[7 marks]

- (b) Suppose that you are designing an application-layer protocol for reliable data transfer where the end-to-end communication paths in the network are rather reliable.

- (i) Discuss whether a positive acknowledgement or a negative acknowledgement reliable data transfer mechanism is more suitable for your protocol if the applications have plenty of data to transfer.

[4 marks]

- (ii) Discuss whether TCP or User Datagram Protocol (UDP) should be used as the transport layer protocol.

[5 marks]

Question 4

- (a) Figure Q4.1 shows a weighted graph with nine nodes (labelled A to I). By using the Dijkstra's shortest path algorithm, generate the least-cost path tree from node A to all other nodes. Show each step of your working.

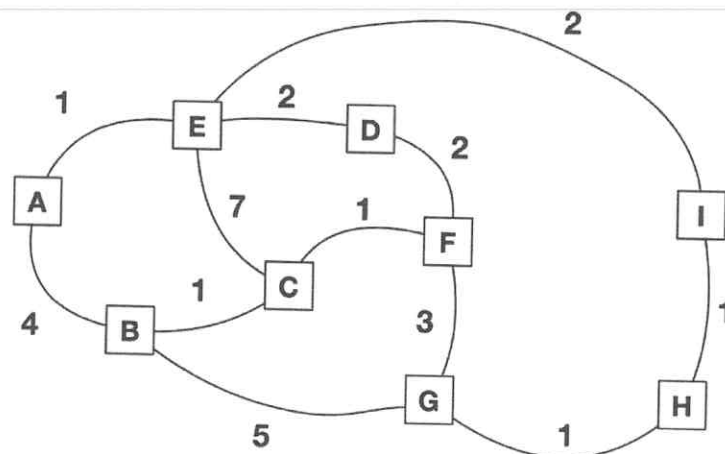


Figure Q4.1

[10 marks]

Continued...

- (b) Figure Q4.2 shows a Multi-Protocol Label Switching (MPLS) network with **R1** and **R5** as the ingress and egress routers, respectively. Flows 1 and 2 are traffic mapped onto two forwarding equivalence classes (FEC) based on their respective destination addresses. All links in the network have a cost value of 1 unit and bandwidth of 10Mbps. The Open Shortest Path First routing protocol is used.

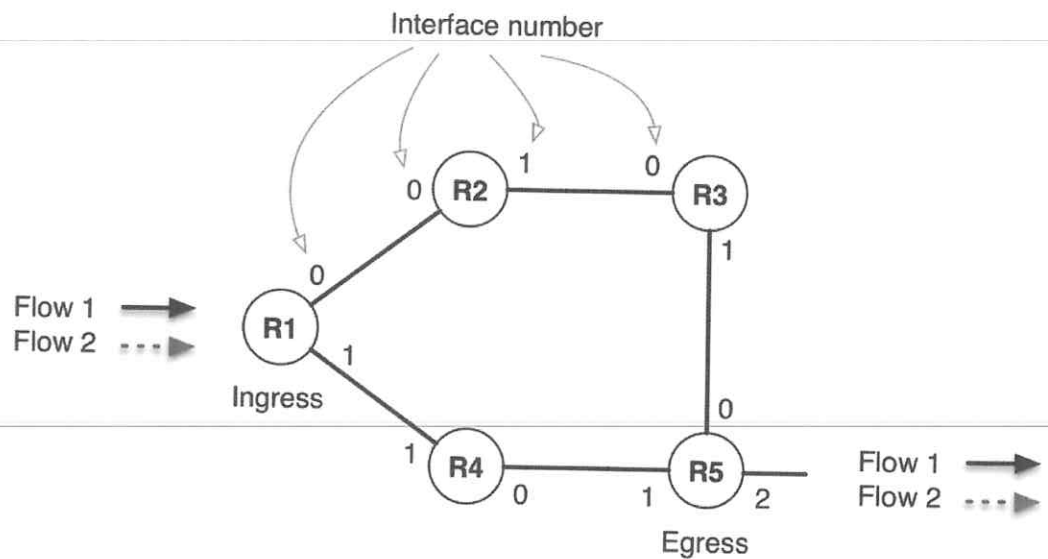


Figure Q4.2

- (i) Describe what FEC is. [3 marks]
- (ii) Describe how the label switched paths for both flows 1 and 2 will be established using the hop-by-hop label distribution protocol. Use the table format shown in Table Q6 for your answers.

Table Q6

In Label	Out Label	Destination	Out Interface

[8 marks]

- (iii) Suppose flow 1 and flow 2 both have a bandwidth requirement of 6Mbps. Will the answer in (b)(ii) still be applicable? Justify your answer.

[4 marks]

End of Paper